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## (54) VALVE ASSEMBLIES FOR PRESSURISED DISPENSERS

(71) We, AEROSOL INVENTIONS & DEVELOPMENT S.A. AIDSA, a Swiss Company of 1 Rue de Fries, CH-1700 Fribourg, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to valve assemblies for pressurised dispensers of the hand-held kind which are commonly known as aerosol cans, and is especially concerned with valve assemblies for use with dispensers containing a liquid pressurised by a gas which is soluble in the liquid.

Increasing use is being made of soluble gas, in particular carbon dioxide, in aerosol packaging in place of fluorinated hydrocarbon propellants. However the use of soluble gases gives rise to difficulties in filling dispensers. It is known to introduce the gas through the valve and the dip tube which extends down into the container for delivery of the liquid to the valve, thus using the route followed by dispensed liquid in reverse. However this results in bubbling of the liquid during filling and the speed of filling is severely restricted.

To overcome the problem of bubbling and increase the speed of filling it has been proposed to introduce the gas at the top of the container through a valve assembly designed to allow this form of filling technique as well as the subsequent dispensing of the liquid. In one known design the valve is fitted to its mounting cup with a sealing gasket that is arranged to distort under the higher pressure of filling but to provide a fixed seal under the lower pressure in the dispenser during normal use. However it has been found difficult to provide such a seal which is reliable in operation.

According to the present invention we provide a valve assembly for a pressurised dispenser comprising a cylindrical valve body for mounting in an opening in a container and a rigid valve member movable in the body and having mounted rigidly on it, to move with the valve member, a piston sliding within the body and making a sealing

engagement with the inner surface of the body, the valve member having a portion extending outside the valve body for actuation by external means and being movable between three positions, namely, a closed position in which the valve member seals the interior of the container against communication with the exterior, a dispensing position in which a dip tube extending from the valve body is put into communication with an outlet leading to the exterior, and a filling position, in which the valve member is further from the closed position than it is in the dispensing position, and in which the piston is displaced far enough within the valve body to uncover ports in the wall of the body that put the interior of the container around the valve body in direct communication with the outlet i.e. other than through the dip tube, the valve member being resiliently urged towards the closed position.

The dispensing position may be defined by abutment means formed in the valve, which means is arranged to deflect under the force of a machine filling head during filling to allow the valve to move to the filling position but which will not deflect under manual pressure applied by a user. However it is preferable that the dispensing position is defined, when the valve is in use on a container, by an actuating button for operating the valve, movement of the button being restricted by engagement with the container when the dispensing position is reached. Filling can be achieved either by removing the button or by using a button with a skirt which engages the container through a portion which will deflect under the pressure of a filling machine head but which will not deflect under manual pressure applied by a user.

An embodiment of the invention and one modification thereof will now be described, by way of example only, with reference to and as shown in the accompanying drawings, in which:—

Figure 1 is an axial section through a valve shown mounted on the upper end of a container and provided with a button, and

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Figure 2 is a portion of a modified button shown in section.

The valve shown in Figure 1 is mounted on a container 2 by way of a mounting cup 3. The valve comprises a valve member 4 movable axially in a valve body 5. The valve body 5 is of cylindrical form with an external radial flange at its upper end held in the boss 3a of the valve mounting cup 3 by crimping, with a sealing gasket 6 covering the upper end of the body 5 interposed between the body and the valve mounting cup. The valve member 4 is in the form of a spindle 4a guided by an internal radial flange 9 in the lower end of the body 5 and by a piston 4b formed integrally with the spindle 4a intermediate its ends and being a close sliding fit in the valve body. The valve spindle 4a is provided with an axial passage 11 extending from its lower end where it is connected to a dip tube 13 to just above the piston 4b where it communicates by way of a transverse passage 12 through the spindle with a chamber 10 found in the body between the piston 4b and the sealing gasket 6.

The valve member 4 is urged upwards by a helical coil spring 7 acting between the piston 4b and the internal flange 9 at the lower end of the body. The spring 7 urges the valve member 4 into its closed position in which the upper end of the spindle abuts and seals against the gasket 6.

The upper end of the spindle 4a is provided with a blind axial recess 21 to receive the hollow stem 15 of a male actuating button 1, the stem passing into the valve through central openings in the boss 3a and the gasket 6. The button 1 is provided with a cylindrical skirt 18 a little larger in diameter than the valve mounting cup 3 and having its lower edge 19 spaced a distance *a* from the top of the container 2. On depression of the button 1 the valve member 4 moves downwards from the closed position by a distance *a* to a dispensing position. Further downward movement is prevented by the skirt 18 of the button engaging the top of the container 2. In this position the seal between the top of the valve member 4 and the gasket 6 is broken and the hollow stem 15 is put in communication with the chamber 10 by way of a slot 16 formed in the end of the stem. The hollow stem 15 leads to a nozzle 17 formed in the button 1, and the chamber 10 leads by way of passages 11 and 12 and the dip tube 13 to the interior of the container 2. Thus pressurised liquid in the container can be dispensed from the nozzle.

When the button 1 is not fitted the valve member can be moved downwards from the closed position by a distance *b* greater than *a* to a filling position. This movement can be brought about by the insertion of a stem on a filling head (not shown) inserted into the

valve in place of the stem 15 of the button 1. In the filling position the piston 4b is moved below the upper edges of a number of apertures 20 formed in the cylindrical wall of the valve body 5 so as to put the chamber 10 into direct communication with the upper end of the interior of the container 2. However it should be noted that the upper edges of the apertures 20 are below the level to which the piston is moved when the valve member 4 is in its dispensing position. Downward movement of the valve member 4 is limited in the filling position by engagement of the piston 4b with a collar 9a formed at the inner edge of the internal radial flange 9 at the lower end of the body 5.

During filling of the container 2 with gas, the container already being charged with liquid leaving a small gas space at the top of the container, some gas will pass down through the dip tube 13. However, most of the gas will pass through the apertures 20 and directly into the gas space. The valve automatically closes under the action of the spring 7 on removal of the stem of the filling head. A button can then be fitted and the liquid dispensed in the normal way by depression of the button which is as already described limited to a distance *a*. Thus rapid filling can be achieved without excessive bubbling of the gas in the liquid and without disturbing the components that provide the seal between the valve and the container.

The button 1 shown in Figure 1 may be replaced by a modified form shown in part in Figure 2. Figure 2 shows the lower edge 24 of the skirt 22 of the modified form of button which is provided with a plurality of tabs 23. The lower edge of the tabs 23 is spaced by the distance *a* from the top of the container 2 and the lower edge of the skirt itself by a distance a little greater than *b*. On manual depression of the valve the tabs 23 remain in place and limit movement of the valve member to distance *a*. However, if considerably more force is applied to the button, such as can be exerted by a gas filling head, then the tabs 23 deflect and allow the button to move distance *b* to put the valve into its filling position. The container can then be filled with the button in position, a suitable connection, as is well known in the art, being provided between the filling head and the stem of the valve through the button. An annular rib 24 around the lower edge of the skirt acts as reinforcement at the roots of the tabs to prevent breakage under the substantial force required during filling.

It will be understood that other modifications may be applied to the valve within the scope of the invention. For example the apertures 20 may be replaced by grooves on the inside of the valve body 5 leading to apertures in the internal radial flange 9. Moreover a hole of a predetermined size

may be formed through the piston 4b to allow a measured rate of gas flow to occur during dispensing.

5 Finally the periphery of the piston may be formed with a resilient sealing skirt such that during filling under pressure the injected gas deforms the seal in the manner of a flap valve. After filling the skirt returns to its sealing position and is held there by pressure in the filled container.

#### WHAT WE CLAIM IS:—

15 1. A valve assembly for a pressurised dispenser comprising a cylindrical valve body for mounting in an opening in a container and a rigid valve member movable in the body and having mounted rigidly on it, to move with the valve member, a piston  
20 sliding within the body and making a sealing engagement with the inner surface of the body, the valve member having a portion extending outside the valve body for actuation by external means and being movable  
25 between three positions, namely, a closed position in which the valve member seals the interior of the container against communication with the exterior, a dispensing position in which a dip tube extending from the valve body is put into communication  
30 with an outlet leading to the exterior, and a filling position, in which the valve member is further from the closed position than it is in the dispensing position, and in which the piston is displaced far enough within the valve body to uncover ports in the wall of the body that put the interior of the container around the valve body in direct communication with the outlet i.e. other than  
35 through the dip tube, the valve member being resiliently urged towards the closed position.

2. A valve assembly according to claim 1 including abutment means to define the dispensing position when the valve member  
45 is manually actuated.

3. A valve assembly substantially as herein described with reference to Figure 1 of the accompanying drawings.

4. In combination a container, a valve assembly and an actuator for a valve member within the valve assembly, the valve assembly being in accordance with claim 1 and the dispensing position being defined by engagement of abutment means on the  
50 actuator with the container.

5. A combination according to claim 4, in which the abutment means comprises the edge of a cylindrical skirt forming part of the actuator.

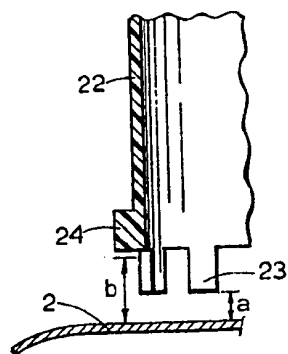
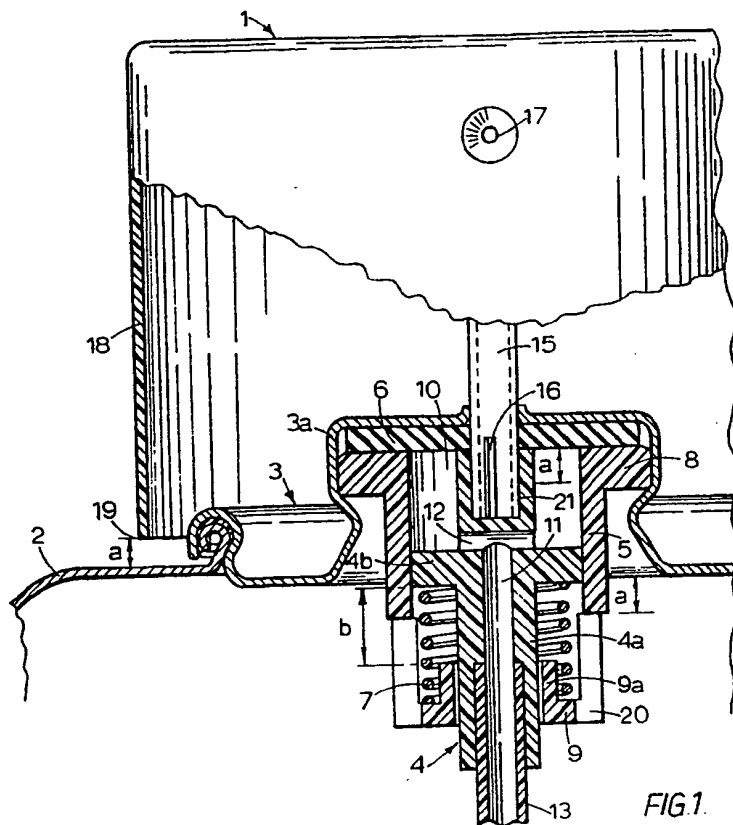
6. A combination according to claim 5, in which the edge of the skirt is deformable on the application of a force considerably greater than that which can be applied manually to the actuator to actuate the valve member.

7. A combination according to claim 6, in which the edge of the skirt is formed with deformable tabs.

8. In combination a container, a valve assembly and an actuator substantially as herein described with reference to Figure 1 of the accompanying drawings.

9. The combination of claim 8 modified substantially as herein described with reference to Figure 2 of the accompanying drawings.

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